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Development of a LIDAR for Aerosol and Turbulence Measurements in the Boundary Layer

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We are adapting a LIDAR developed at Lawrence Livermore National Laboratory to a large diameter (30") Cassegrain telescope for continuous range resolved measurements from the surface layer to altitudes of about 1 km. The large optic enables excellent spatial resolution and opens the possibility of detailed studies of large and small eddy formation within the boundary layer. The temporal resolution of the system is also high enough so that these measurements are meaningful. As the LIDAR indirectly determines the backscatter due to aerosols, their profile can also be determined. Due to the abundance of aerosols and other airborne particulates below 1 km, continuous profiling down to the surface layer is an important issue in atmospheric radiation measurements and turbulence impacts the atmospheric chemistry through mixing. This LIDAR has demonstrated the ability to make measurements from near aperture distances of 15 meters. Our approach in developing this technique is to explore design concepts and evaluate them on a test bed, then consolidate the best options into a portable field unit. The telescope facility which is evolving into the Howard University Atmospheric Observatory will allow us to do this in a cost effective manner. A companion paper by Venable, et al. discusses the advantages of this observatory for instrument development.

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